

IOWA STATE UNIVERSITY

Digital Repository

Economics Presentations, Posters and
Proceedings

Economics

2020

The Impact of China's Location Based Environmental Regulations on Hog Industry and Water Quality: A Synthetic Difference in differences Approach

Nieyan Cheng

Iowa State University, nycheng@iastate.edu

Wendong Zhang

Iowa State University, wdzhang@iastate.edu

Tao Xiong

Huazhong Agricultural University

Follow this and additional works at: https://lib.dr.iastate.edu/econ_las_conf



Part of the [Agribusiness Commons](#), [Agricultural and Resource Economics Commons](#), [Agriculture Commons](#), and the [Environmental Policy Commons](#)

Recommended Citation

Cheng, Nieyan; Zhang, Wendong; and Xiong, Tao, "The Impact of China's Location Based Environmental Regulations on Hog Industry and Water Quality: A Synthetic Difference in differences Approach" (2020). *Economics Presentations, Posters and Proceedings*. 66.
https://lib.dr.iastate.edu/econ_las_conf/66

This Poster is brought to you for free and open access by the Economics at Iowa State University Digital Repository. It has been accepted for inclusion in Economics Presentations, Posters and Proceedings by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.

The Impact of China's Location Based Environmental Regulations on Hog Industry and Water Quality: A Synthetic Difference in differences Approach

Disciplines

Agribusiness | Agricultural and Resource Economics | Agriculture | Environmental Policy

Comments

This is a selected poster prepared for presentation at the 2020 Agricultural & Applied Economics Association Annual Meeting, Kansas City, MO July 26-28, 2020.

**The Impact of China's Location Based Environmental Regulations on Hog Industry and
Water Quality: A Synthetic Difference in differences Approach**

Nieyan Cheng
Department of Economics
Iowa State University
nycheng@iastate.edu

Wendong Zhang
Department of Economics
Iowa State University
wdzhang@iastate.edu

Tao Xiong
Department of Agricultural Economics & Management
Huazhong Agricultural University
taoxiong@mail.hzau.edu.cn

***Selected Poster prepared for presentation at the 2020 Agricultural & Applied Economics
Association Annual Meeting, Kansas City, MO
July 26-28, 2020***

Copyright 2020 by Nieyan Cheng, Wendong Zhang and Tao Xiong. All rights reserved.
Readers may make verbatim copies of this document for non-commercial purposes by any
means, provided that this copyright notice appears on all such copies

The Impact of China's Location-Based Environmental Regulations on Hog Industry and Water Quality: A Synthetic Difference-in-differences Approach

Nieyan Cheng^{1,2}, Wendong Zhang^{1,2}, Tao Xiong³

Introduction

- Water pollution from livestock manure becomes a global issue.
- China set up location-based environmental regulations since 2014 to regulate hog manure. The whole country has been divided into Development Control Zones (DCZs) and Non-development Control Zones (Non-DCZs).
- Closure is the main implementation method for provinces in DCZs.

Research Questions

- Can China's location-based environmental regulations on the livestock industry significantly reduce hog inventory and improve water quality?
- Are the changes of hog inventory and water quality different across provinces and within province?

Empirical Strategy: Synthetic DID

- Division of DCZs and Non-DCZs.
- Before and after regulation implementation.

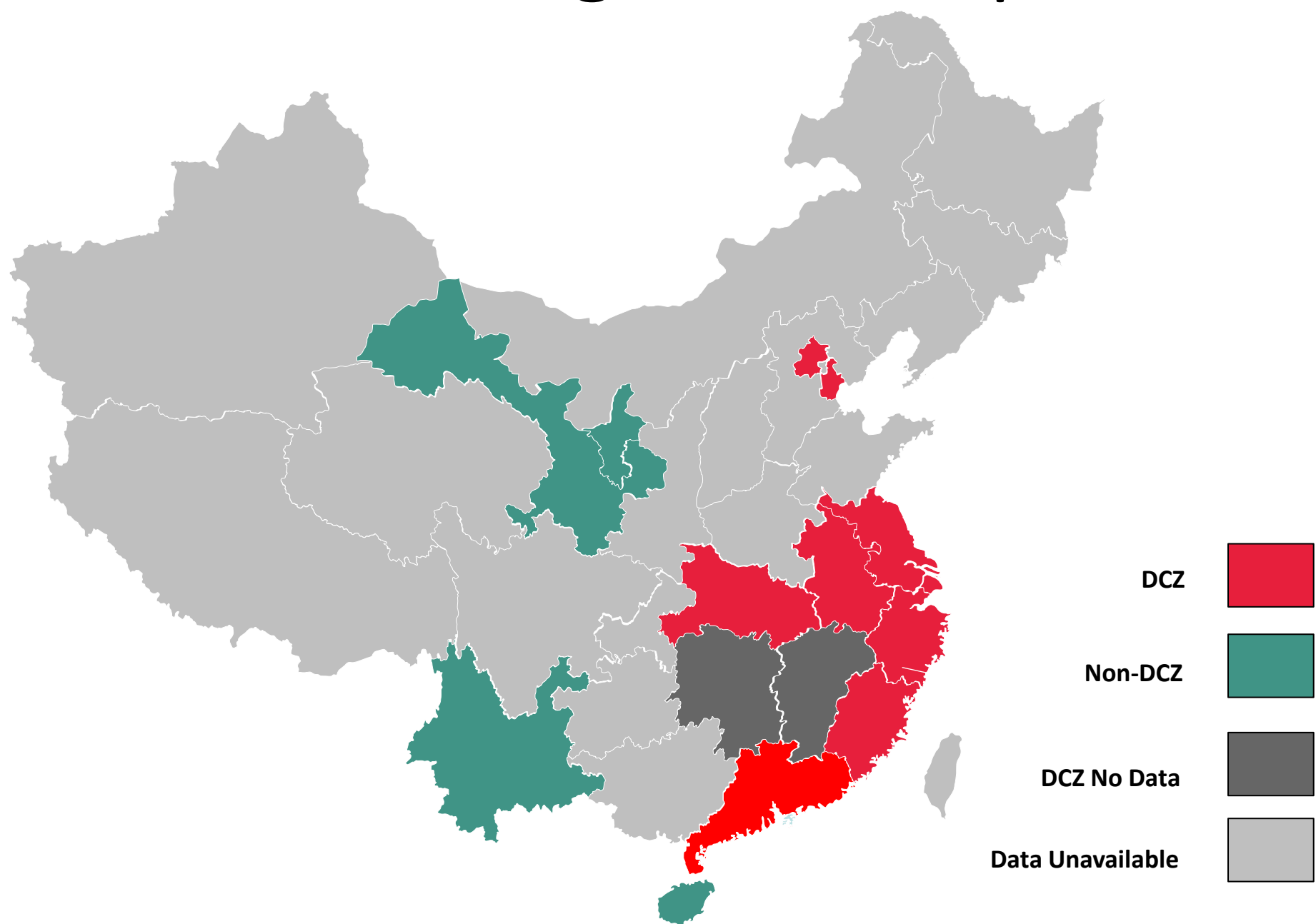


Figure 1: Map of Environmental Control Zones in China

The 2014-2015 Chinese location-based environmental regulations led to 14.7% reduction in hog inventory in DCZ provinces 2016-2017.

- ✓ Heterogeneous treatment effects across and within provinces
 - 28.6 % decline in Zhejiang vs. no reduction in Guangdong, Fujian and Anhui
 - Major hog counties have larger ATT

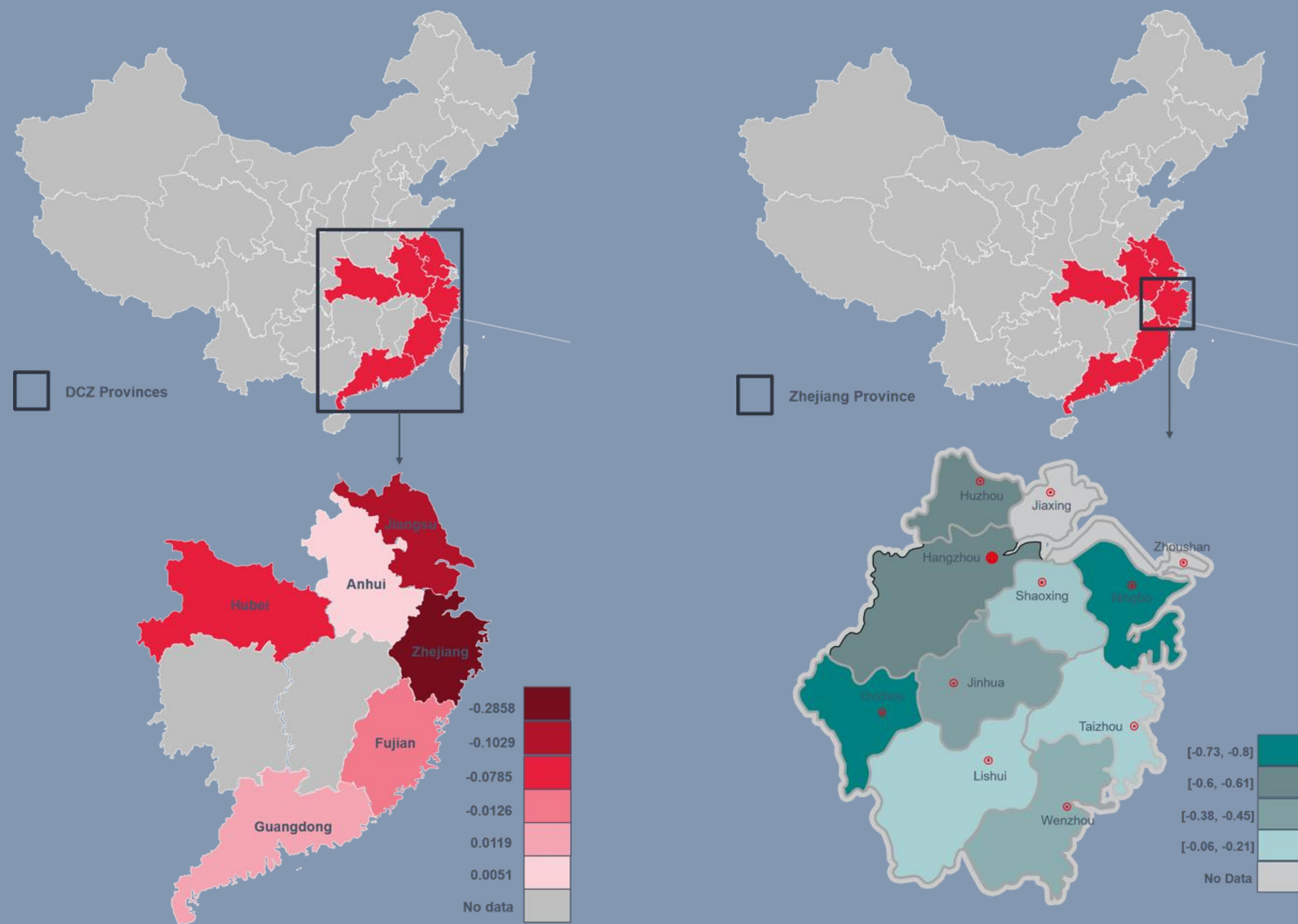


Figure 5: Results of DCZs and Zhejiang Province For Hog Inventory

No evidence of achieving intended policy goal of improving downstream water quality.

Advantages of Synthetic DID over traditional DID and synthetic controls

- Relax parallel common trend assumption
- Adjust imperfect pre-trend fit of synthetic control method

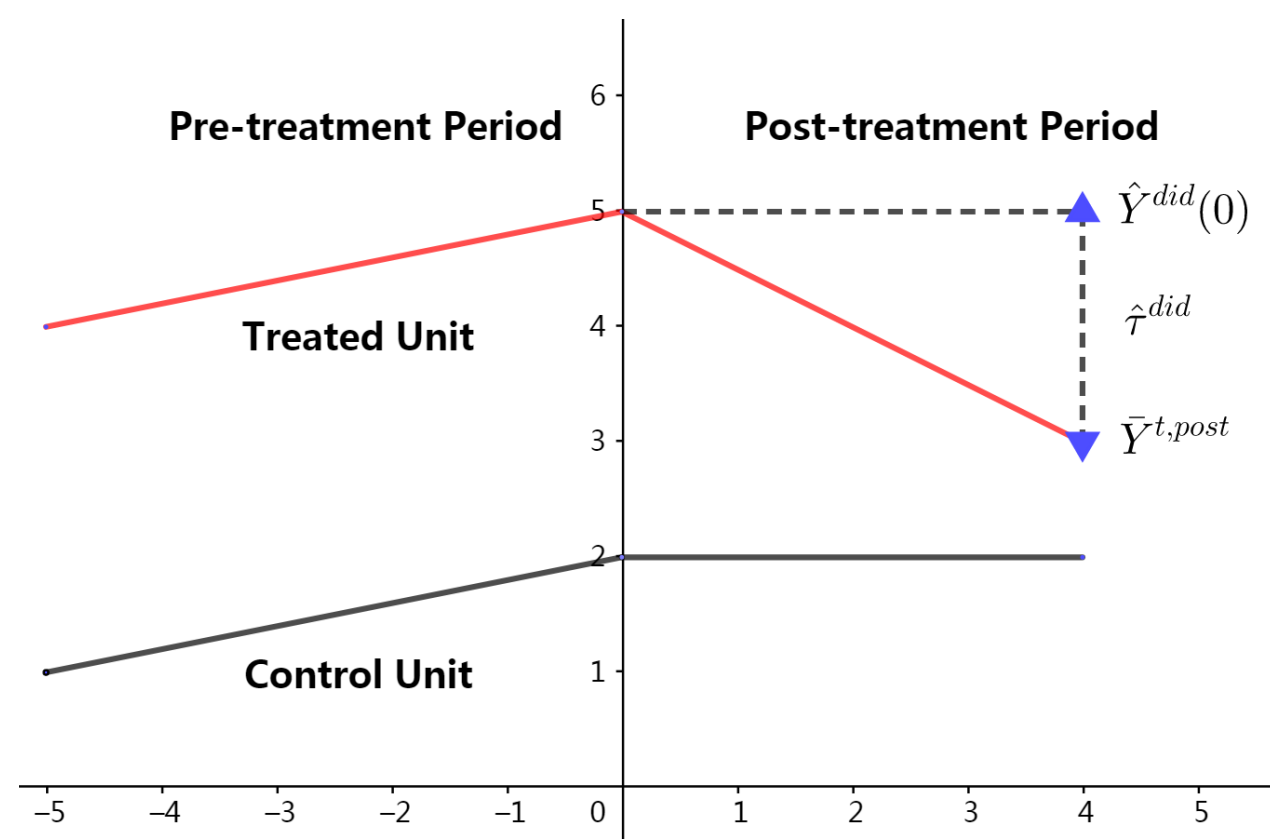


Figure 2: Difference-in-differences Method

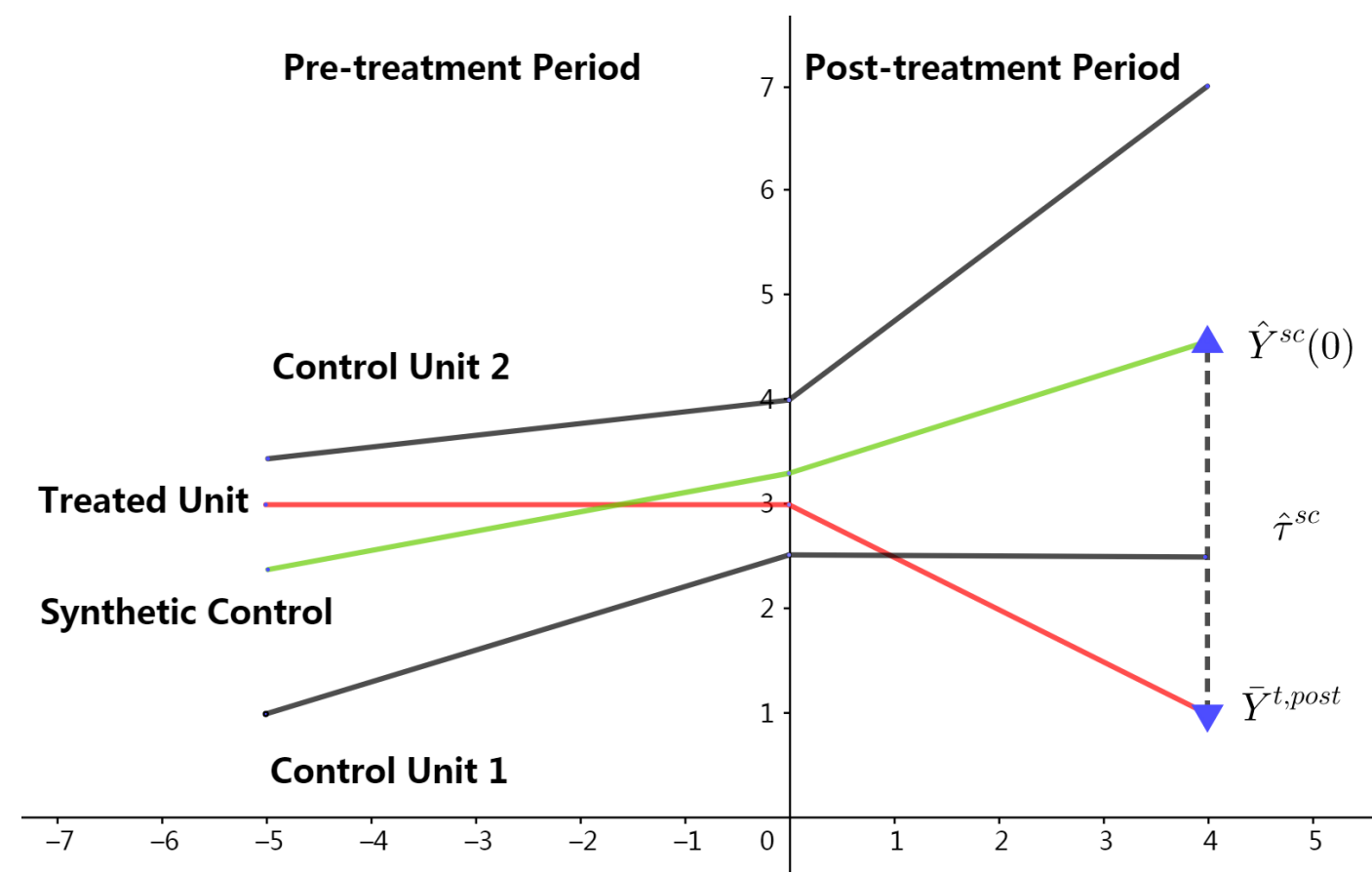


Figure 3: Synthetic Control Method

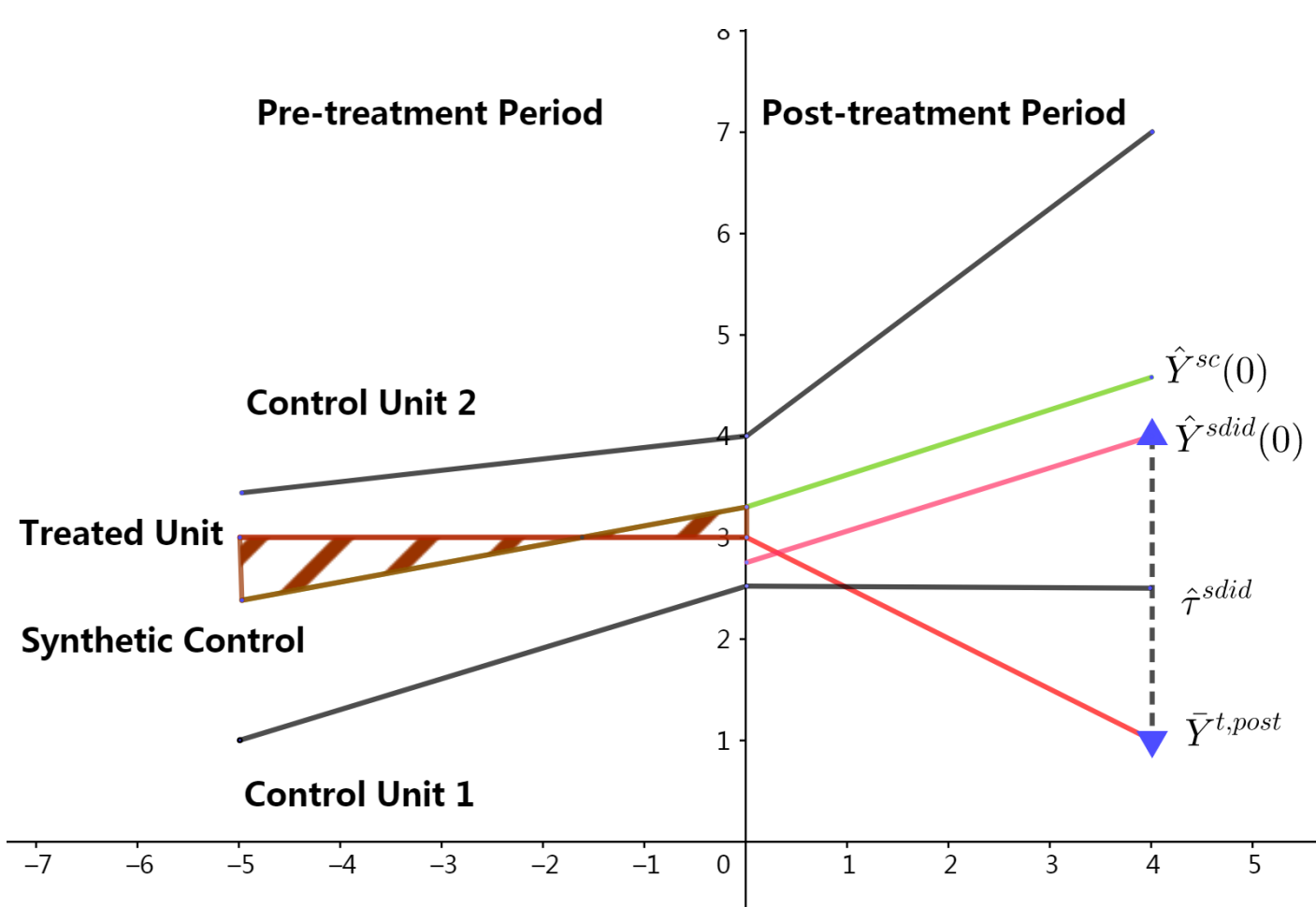


Figure 4: Synthetic Difference-in-differences Method

Data: County level hog inventory data from provincial statistical yearbooks 2010-2017

Selected Reference:

- Arkhangelsky, D., Athey, S., Hirshberg, D. A., Imbens, G. W., & Wager, S. (2019). Synthetic difference in differences (No. w25532). National Bureau of Economic Research.
- R package: <https://github.com/davidahirshberg/synthdid>